



Abiotic reactions may be the most important mechanism in natural attenuation of chlorinated solvents

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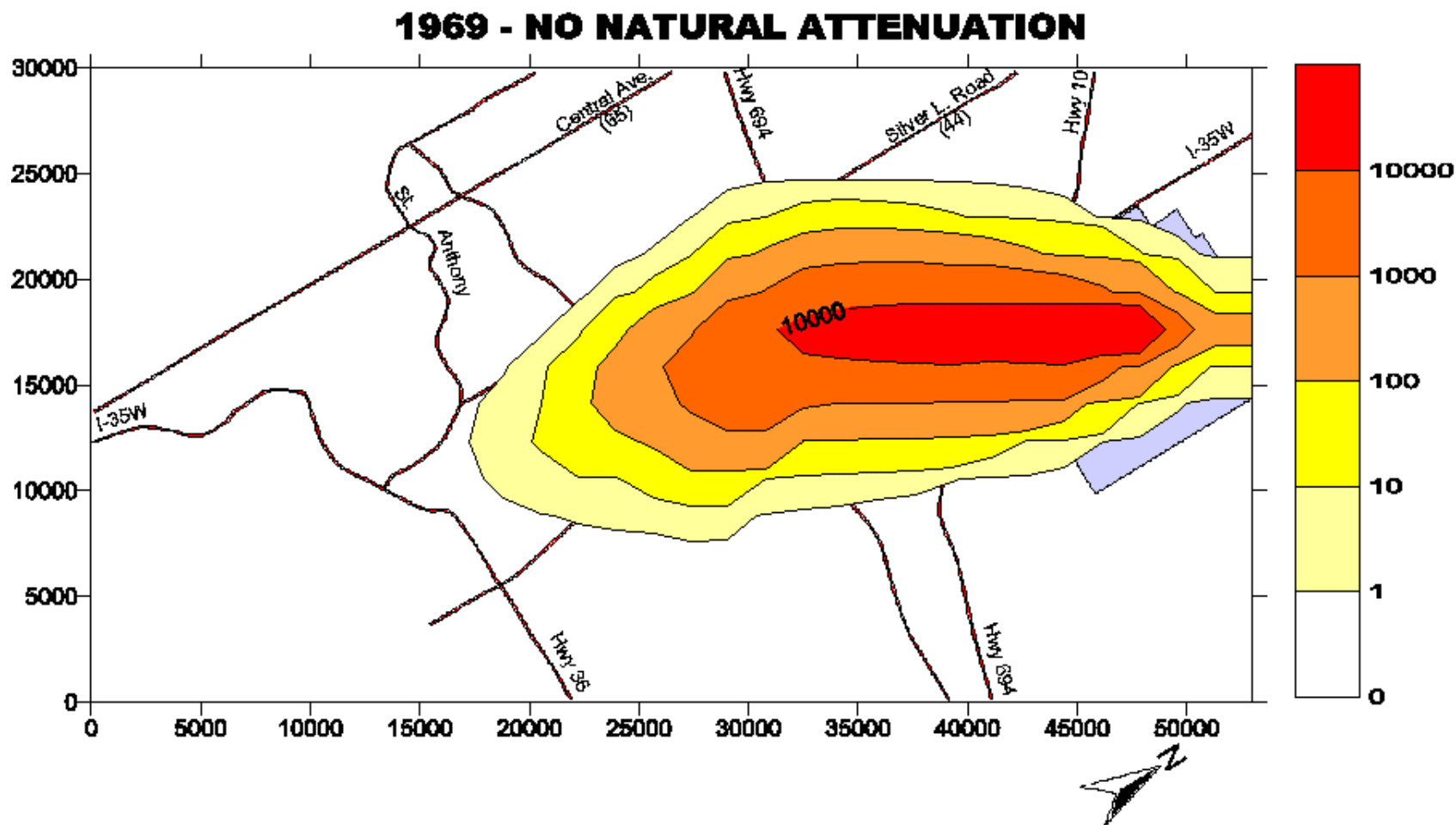
Mark Ferrey

Minnesota Pollution Control Agency

25 Feb, 2003

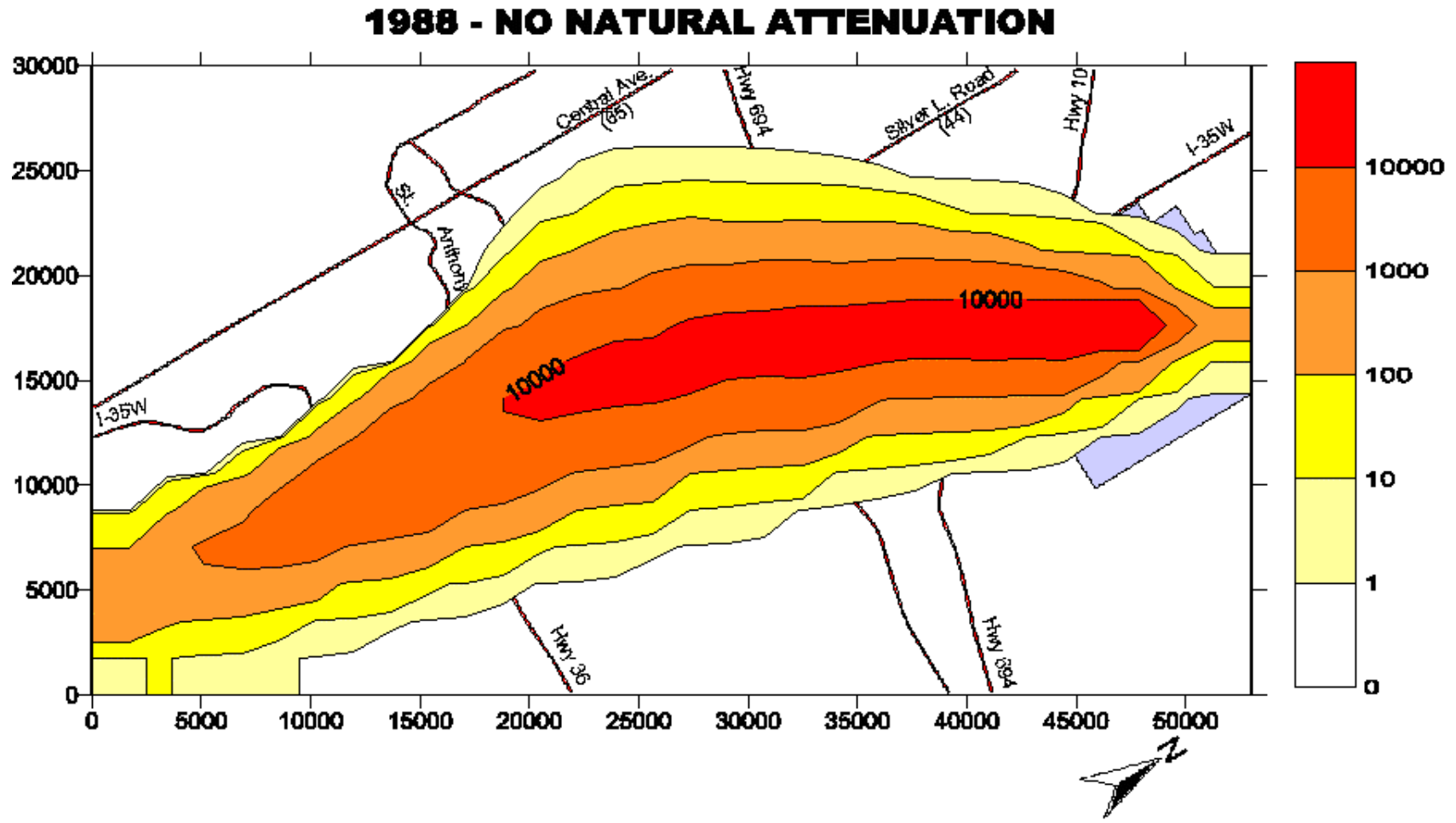


Expected with no natural degradation 1969





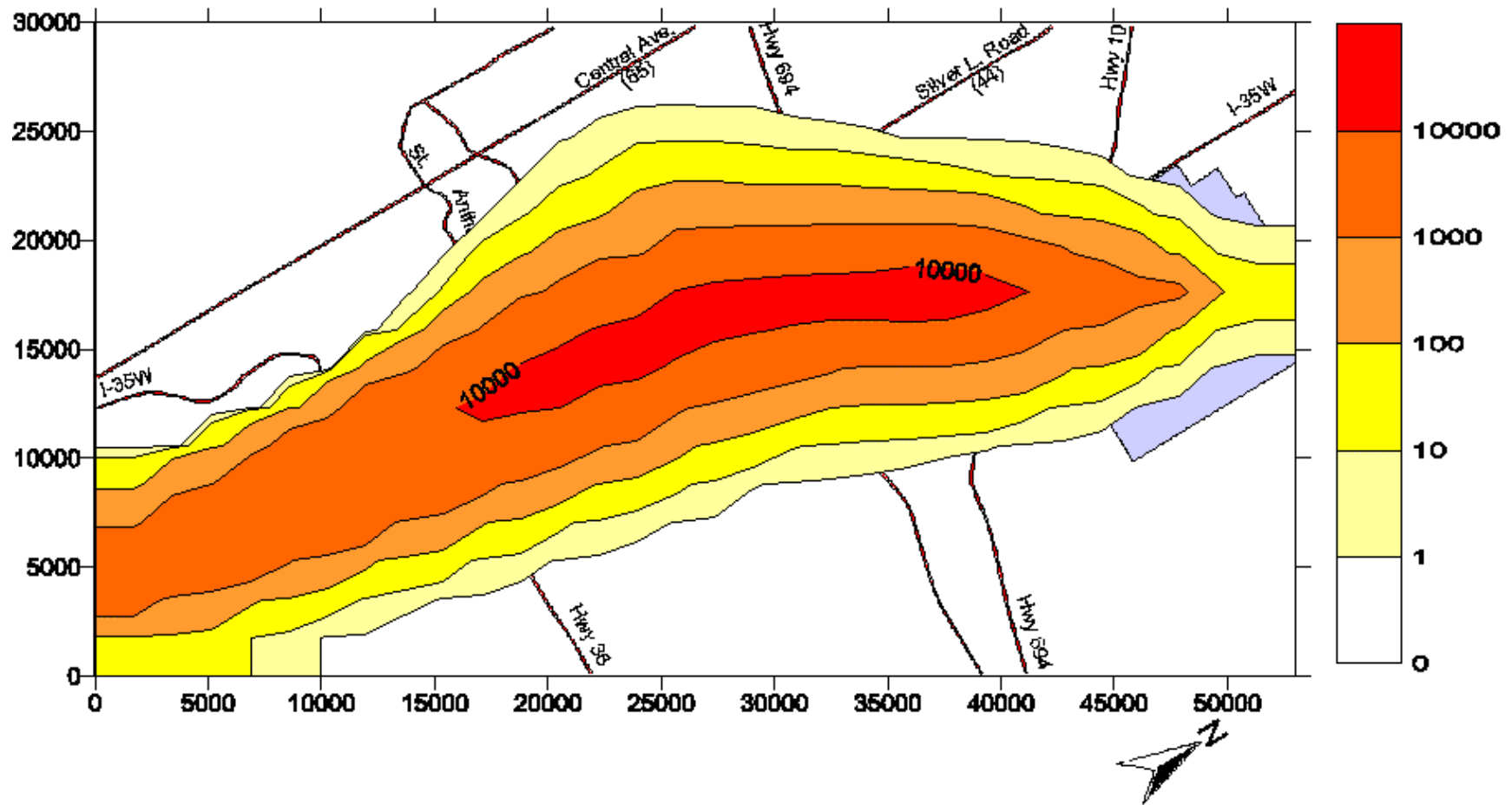
Expected with no natural degradation 1988





Expected with no natural degradation 1998

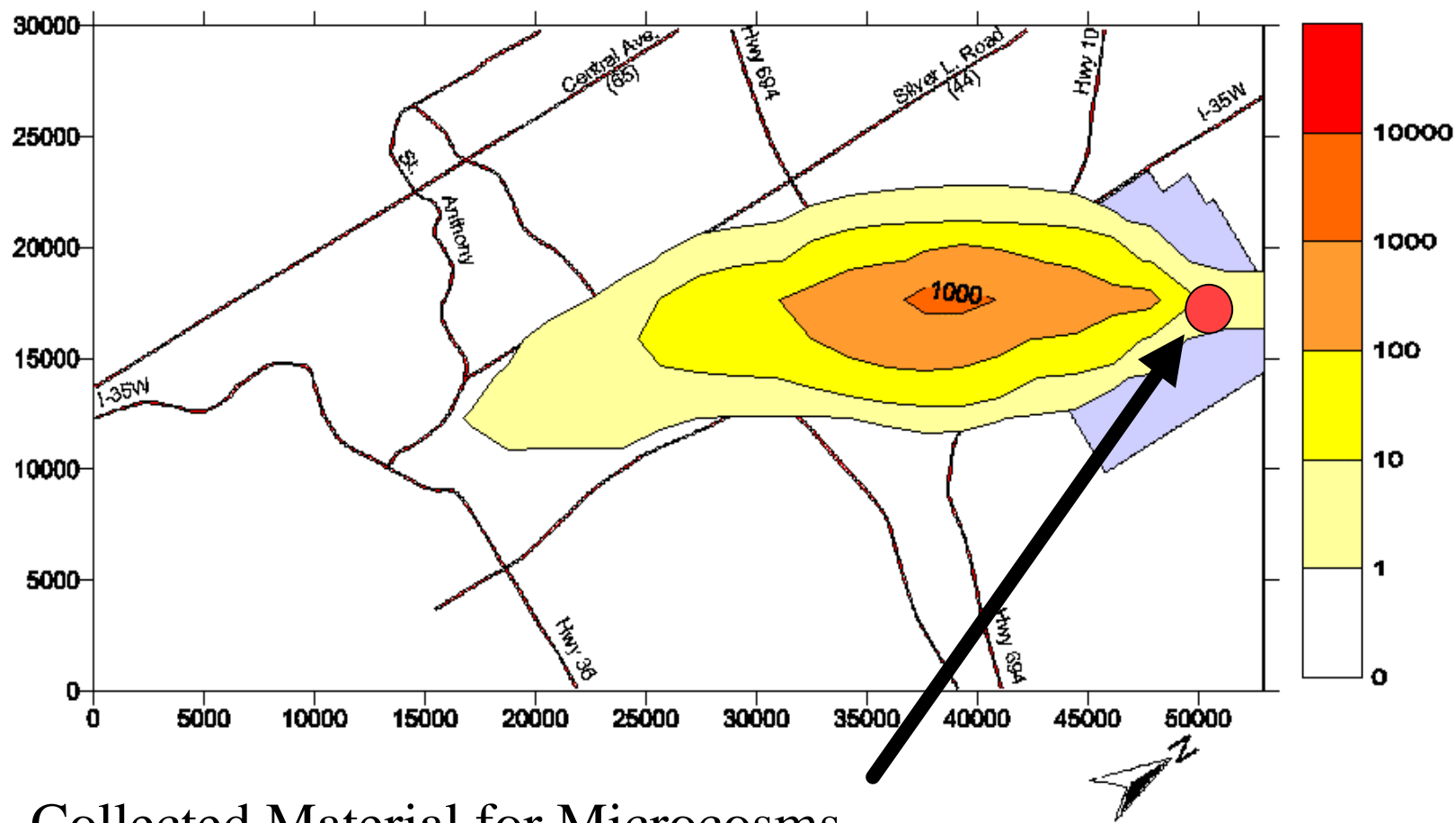
1998 - NO NATURAL ATTENUATION





Actual Disposition of Contamination 1998

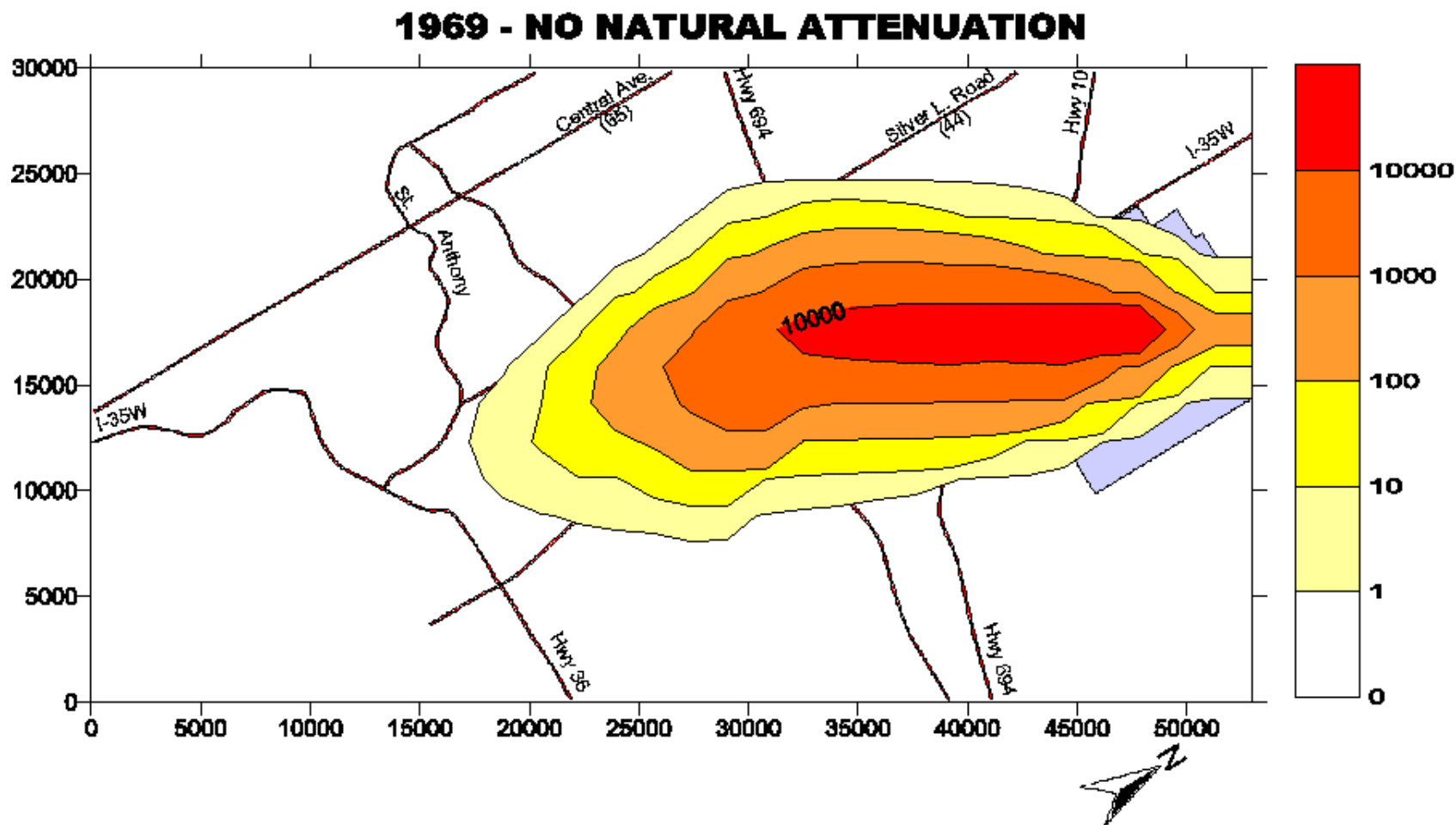
1998 - NATURAL ATTENUATION RATE OF .28 PER YEAR



Collected Material for Microcosms

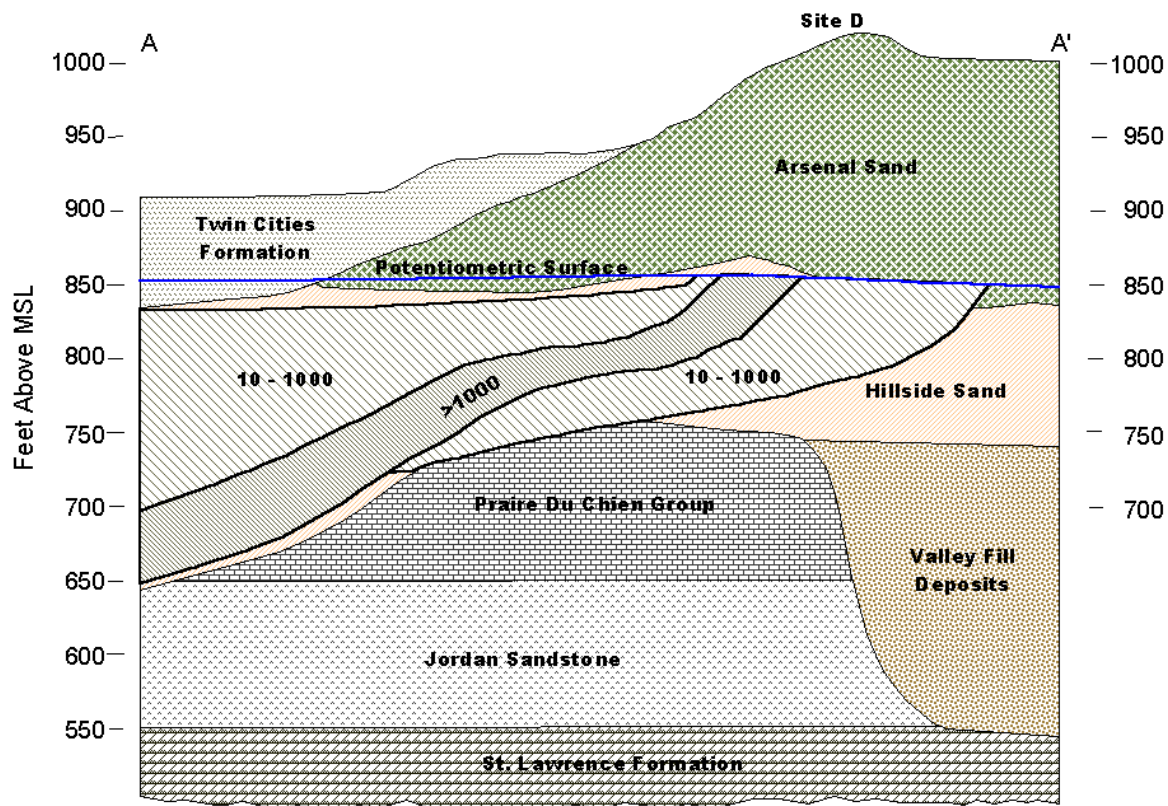


Expected with no natural degradation 1969





Geology of Plume



Cross Section A-A' near Site D



Adding Sediment to Bottle



Promoting Readiness through Environmental Stewardship



Adding Sediment to Bottle



Promoting Readiness through Environmental Stewardship



Adding Contaminants



Promoting Readiness through Environmental Stewardship



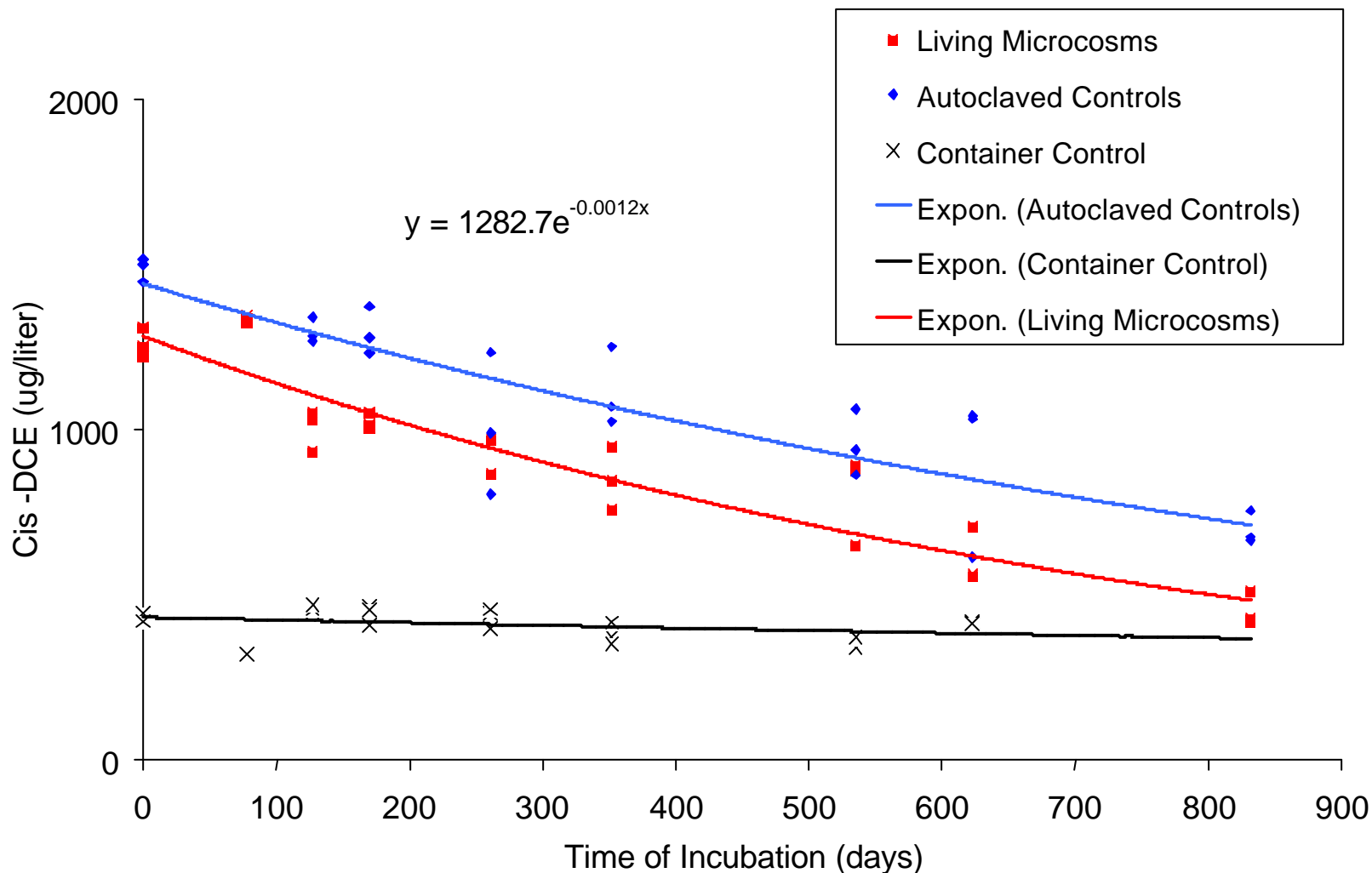
Sealed with a Teflon Septum



Promoting Readiness through Environmental Stewardship

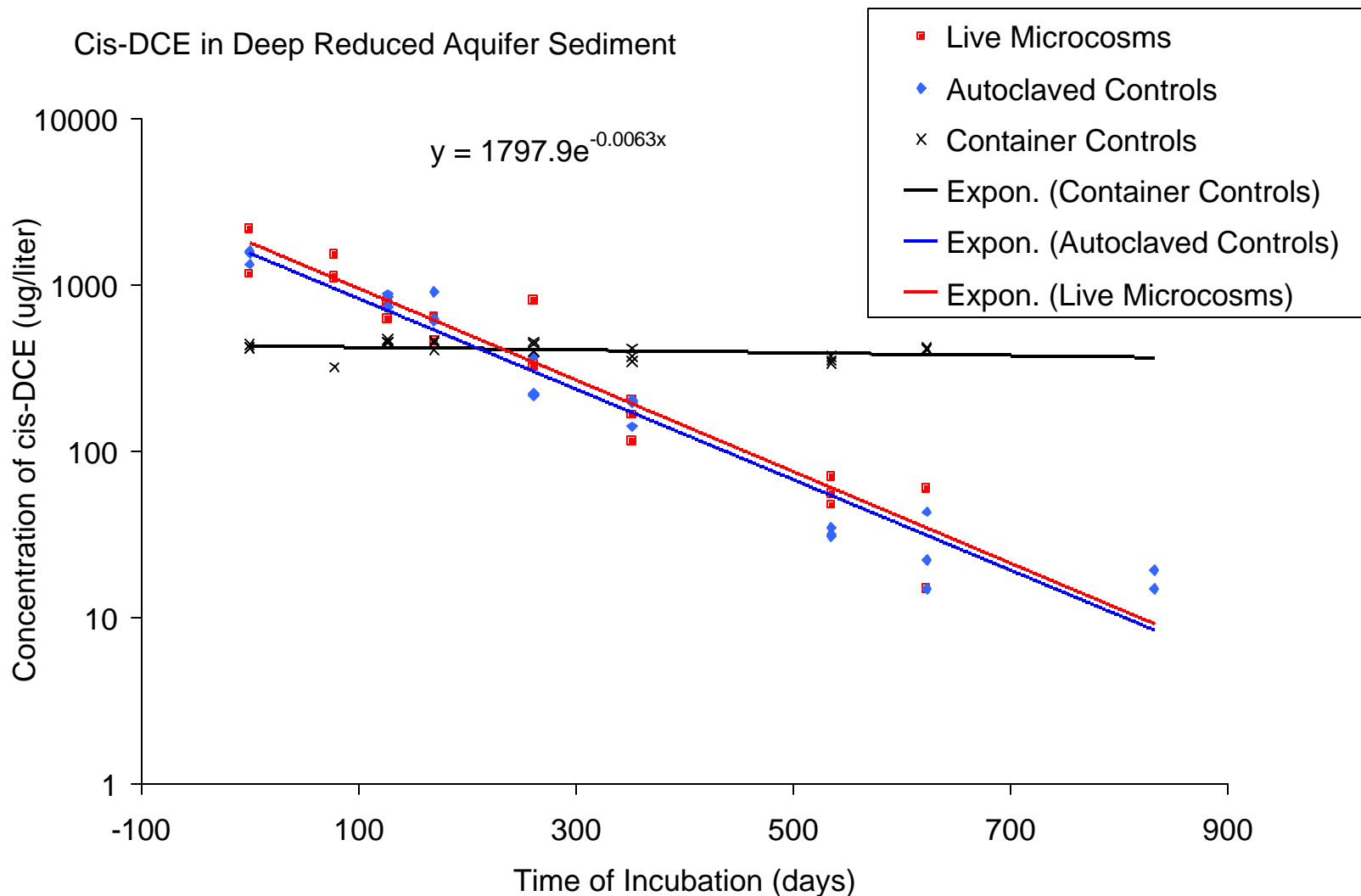


Cis-DCE Removal in oxidized sediment, deepest samples



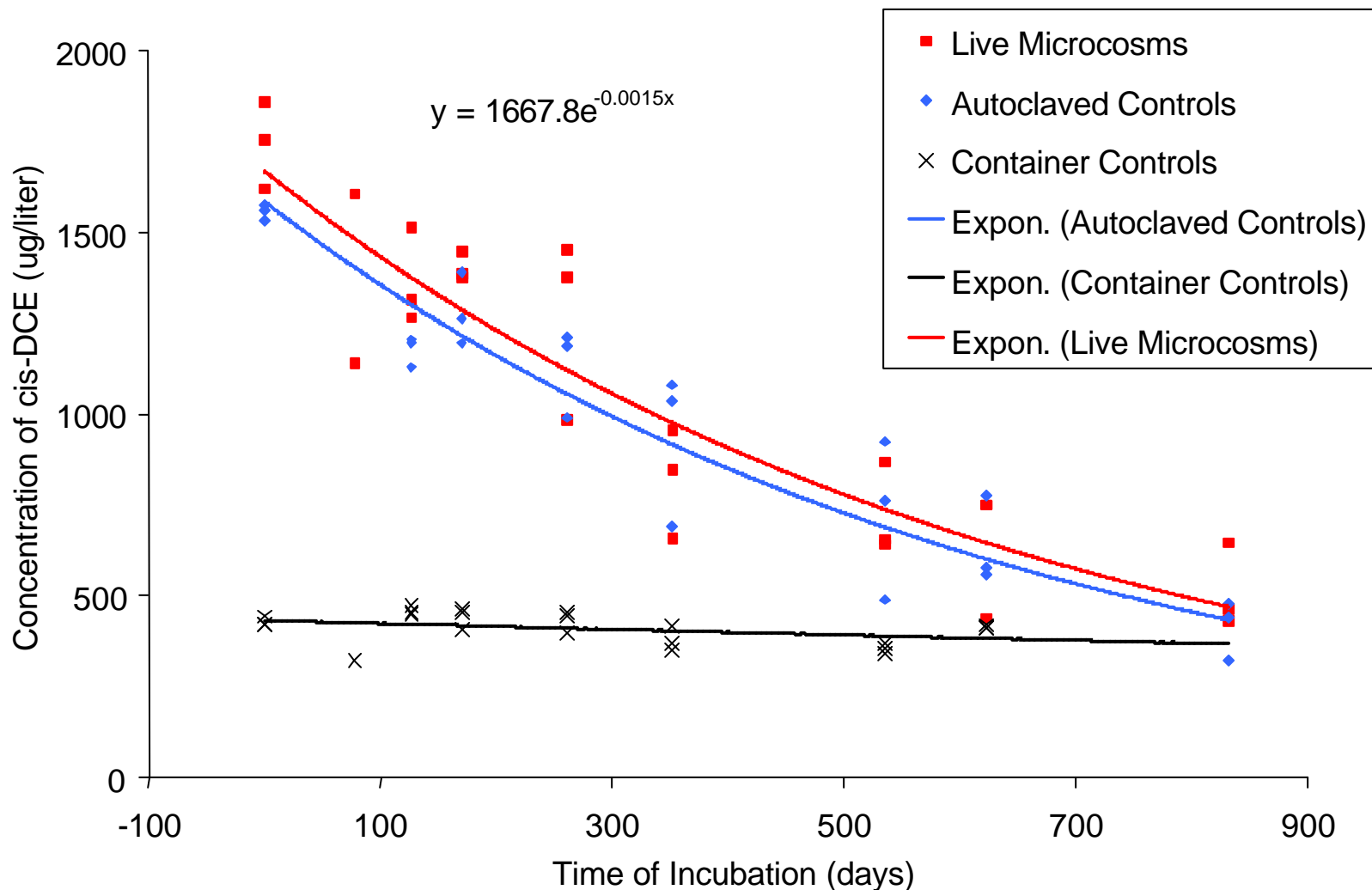


Cis-DCE removal in reduced sediment, intermediate depth





Cis-DCE removal in reduced sediment, near water table





Abiotic Degradation ?

- Cis-DCE, 1,1-DCE, and Vinyl Chloride disappeared in sediment microcosms.
- No accumulation of biotransformation products.
- The rate of disappearance was not affected by autoclaving the sediment (sterilizes the sediment).



Cis DCE rates of removal (per year)

Location	Living	Autoclaved Control
Shallow, reduced	0.55	0.57
Intermediate, Reduced	2.30	2.28
Deep, Oxidized	0.43	0.31
Fit to Model	0.17 to 0.28	



1,1-DCE rates of removal (per year)

Location	Living	Autoclaved Control
Shallow, reduced	1.6	1.4
Intermediate, Reduced		8
Deep, Oxidized		



Vinyl Chloride rates of removal (per year)

Location	Living	Autoclaved Control
Shallow, reduced		
Intermediate, Reduced		
Deep, Oxidized	0.36	0.30